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(54) **Doors and a method of manufacturing same**

(57) A door comprises a rigid frame 10 between two outer plastics skins 12 and 13, and thermally insulating and/or flame retardant material 14 within the frame and between the plastics skins. The frame comprises a plurality of frame members 11 each comprising a plurality of timber strands which have been treated with resin and pressed together. Preferably, the strands are aspen strands and are arranged in a plurality of substantially parallel layers, each of which comprises a plurality of randomly orientated strands, and preferably the resin is a polyurethane resin.

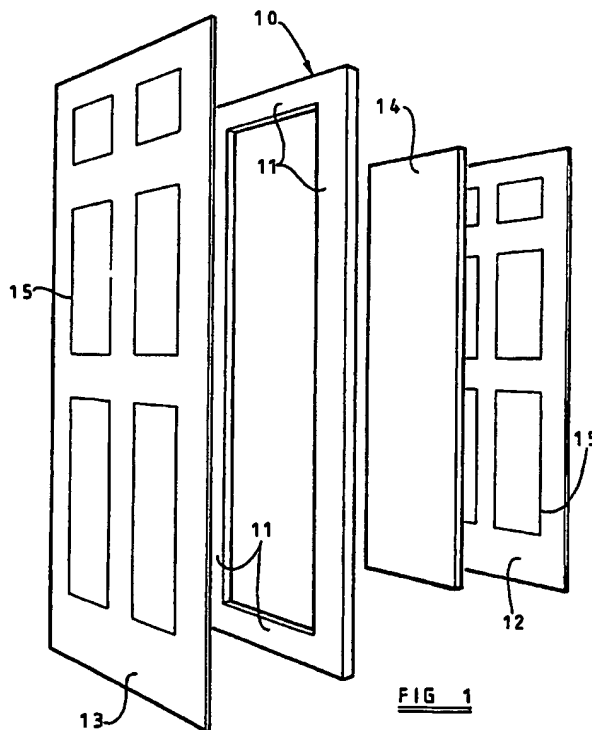


FIG 1

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1990.

GB 2 279 682 A

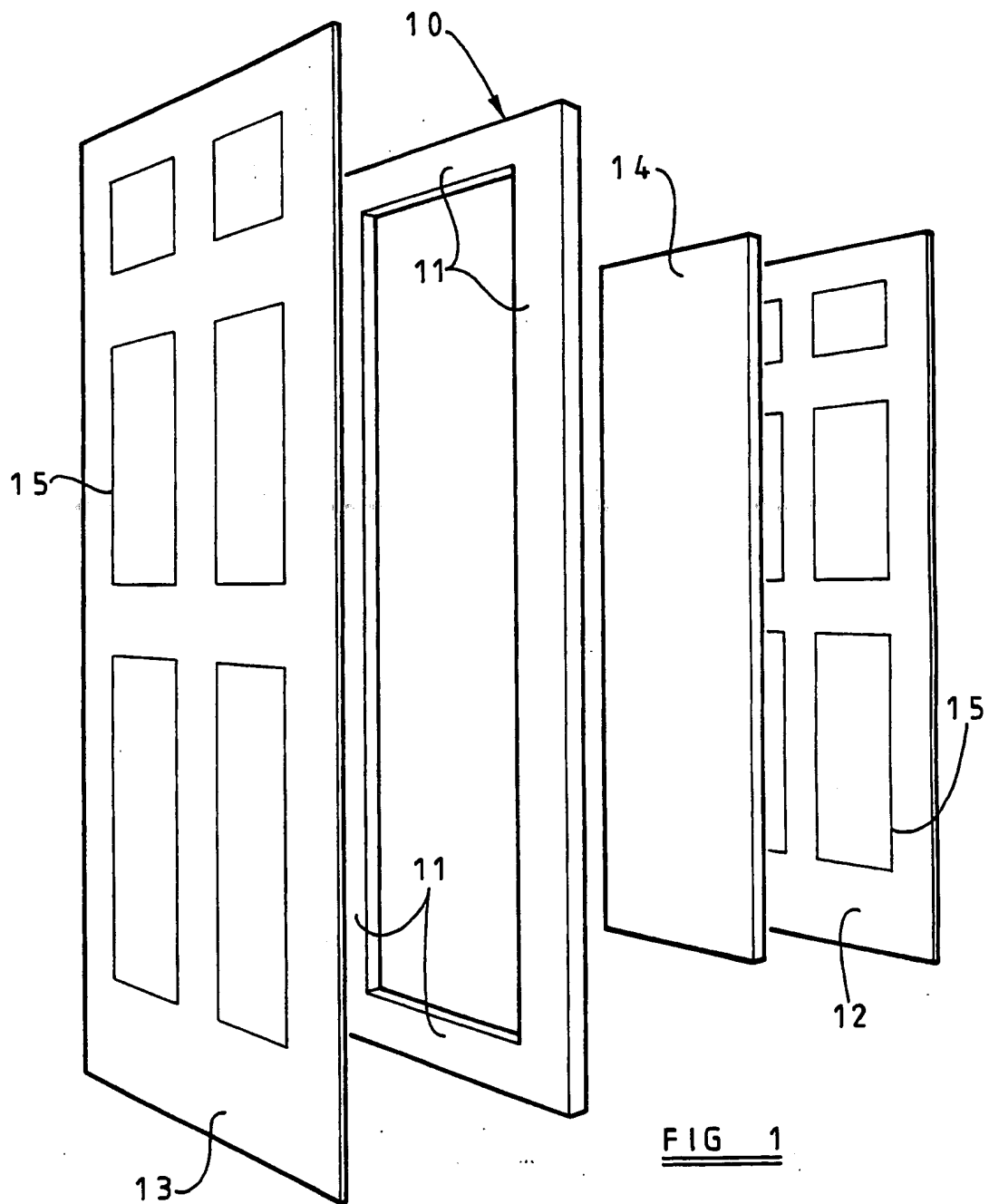


FIG 1

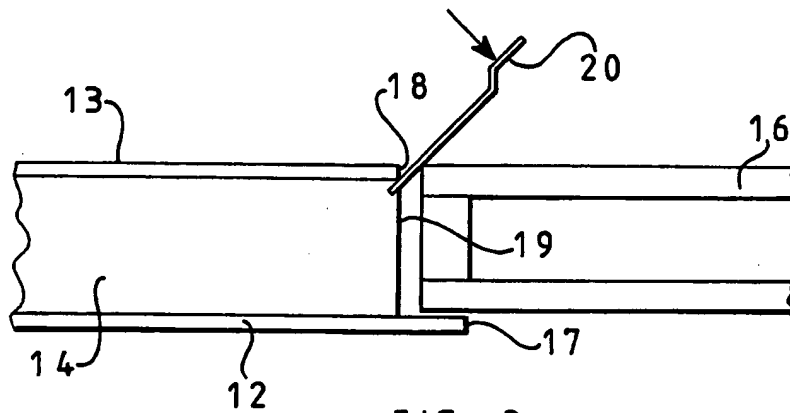
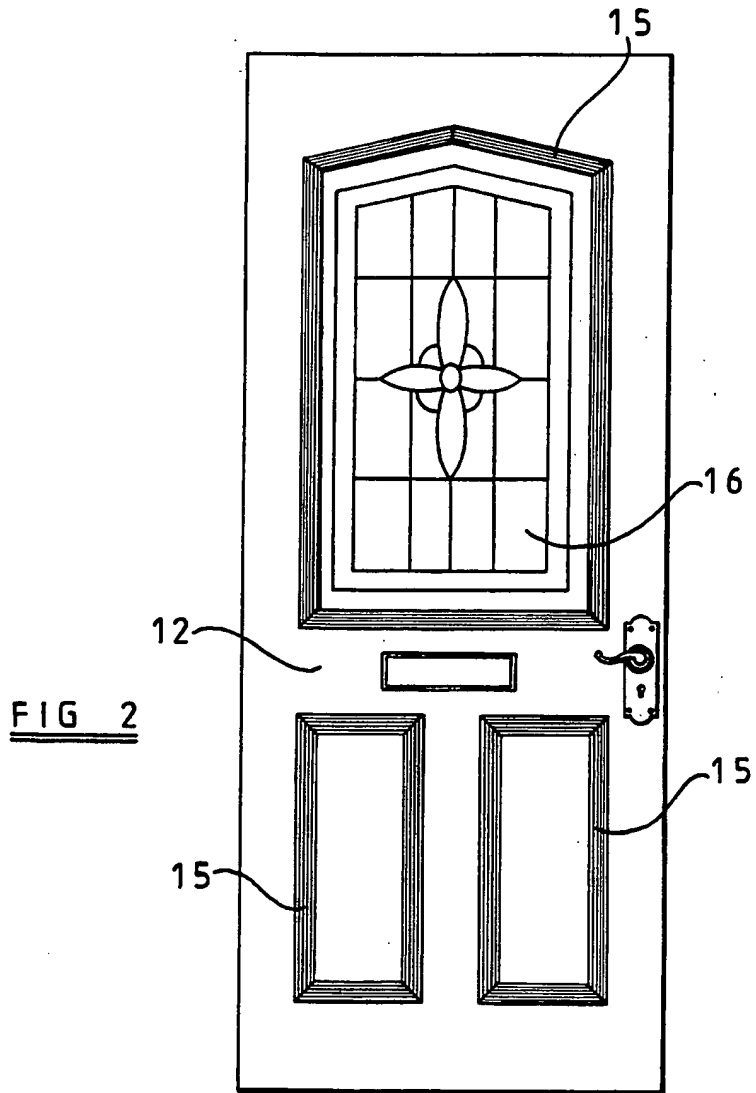


FIG 3

"Doors and a Method of Manufacturing Same"

This invention relates to doors and to a method of manufacturing same.

Conventionally, doors are of solid timber construction, or comprise a timber frame between two outer timber skins. These doors do not generally possess good thermal insulation and require regular maintenance. Glazed doors having extruded aluminium frames are also known, but these are expensive.

10 It is also known from GB 2236346A to provide a door comprising a rigid hardwood frame between two outer plastics skins, and thermally insulating and/or flame retardant material within the frame and between the plastics skins. However, the frames of such doors tend
15 to bow and twist over a period of time and this results in cracking of the plastics skins.

According to the present invention, there is provided a door comprising a rigid frame between two outer plastics skins, and thermally insulating and/or flame
20 retardant material within the frame and between the plastics skins, wherein the frame comprises a plurality of frame members each comprising a plurality of timber strands which have been treated with resin and pressed together.

25 Preferably, the strands are aspen strands.

Preferably, the strands are arranged in a plurality of substantially parallel layers, each of which comprises a plurality of randomly orientated strands.

Preferably, the resin is a polyurethane resin.

Preferably, said skins are of thermoplastics material, e.g. uPVC, and, conveniently, at least one of the said skins is provided with a decorative pattern.

5 When thermally insulating material is provided within the frame and between the plastics skins, this is preferably of slab form, typically a high density polystyrene foam slab, although alternatively it could be, for example, of granular form.

10 Advantageously, each frame member has a minimum width of 80 mm as measured in a plane parallel to the plastics skins.

 Preferably, the plastics skins are bonded to the frame by a moisture curing polyurethane adhesive
15 having a viscosity preferably in the range of 150 to 250 centipoises, and typically 200 centipoises.

 The door may be provided with a glazed panel, and in this case, it is preferable for the panel to be a sealed unit comprising two or more spaced glazing members.

20 When the door is provided with a glazed panel, the two skins each have an aperture aligned with the glazed panel, the aperture in one of the skins being slightly smaller than the glazed panel, and the aperture in the other skin being slightly larger than the glazed
25 panel, the glazed panel being located against the inner face of said one skin and being located with respect to the other skin by retaining means, which may be in the form of clips.

Advantageously, the outer peripheral edge of the frame is exposed. This has the advantage that the edges of the door can be trimmed to size, on site, using a plane.

5 According to another aspect of the present invention, there is provided a method of manufacturing a door comprising the steps of:

- (a) forming a frame comprising a plurality of frame members each comprising a plurality of timber
10 strands which have been treated with a resin and pressed together,
- (b) securing a first plastics skin to one face of the frame,
- (c) placing thermally insulating and/or flame
15 retardant material within the frame, and
- (d) securing a second plastics skin to the other face of the frame.

Preferably, at least one of the skins is provided with a decorative pattern by vacuum forming at an
20 elevated temperature.

Preferably, the strands are aspen strands.

Preferably, the strands are arranged in a plurality of substantially parallel layers, each of which comprises a plurality of randomly orientated strands.

25 Preferably, the resin is a polyurethane resin.

Preferably, the plastics skins are bonded to the frame by a moisture curing polyurethane adhesive having a viscosity preferably in the range of 150 to 250

centipoids, and typically 200 centipoids.

Advantageously, the method also includes the step of providing a glazed panel in the door, and in this case, the two skins are each provided with an aperture, 5 the aperture in one of the skins being slightly larger than the panel and the aperture in the other skin being slightly smaller than the panel, and subsequent to step (d) the glazed panel is passed through the aperture in the one skin to make contact with a part of in the other skin 10 surrounding the aperture therein and the glazed panel is then fixed within the door by retaining means.

The invention will now be more particularly described, by way of example, with reference to the accompanying drawings, in which:-

15 Figure 1 is an exploded perspective view of one embodiment of a door according to the invention,

Figure 2 is a front elevational view of another embodiment of a door according to the invention, and

Figure 3 is a fragmentary sectional view on an 20 enlarged scale, showing the manner in which the glazed panel is fitted to a door of Figure 2.

Referring firstly to Figure 1, the door shown therein comprises a rectangular frame 10 comprising four frame members 11 connected together by corrugated metal 25 fasteners at the corners of the frame, leaving contraction gaps of 0.5mm to 1mm between adjacent members.

The frame members 11 are made of engineered wood and preferably of Intrallam LSL Engineered Wood,

supplied by Trus Joist Macmillan, of Deerwood, Minnesota, USA. Intrallam LSL is made from strands of aspen, which are dried and treated with polyurethane resin. The treated strands are arranged in a plurality of parallel
5 layers, each of which comprises a plurality of randomly orientated strands and the strands are then pressed into solid billets of wood in the presence of steam before being cut to size.

The door also comprises two door skins 12 and
10 13, each in the form of a sheet of thermoplastics material, e.g. uPVC, secured by bonding to two opposite faces, respectively, of the frame 10.

The adhesive used to bound the plastics skins 12 to the frame 10 is preferably a moisture curing
15 polyurethane adhesive having a viscosity preferably in the range of 150 to 250 centipoises, and typically 200 centipoises. This is a relatively low viscosity adhesive and ensures a high degree of penetration into the engineered wood frame members.

20 An inner core 14 of thermally insulating material is provided within the frame 10 and between the skins 12 and 13. The core 14 is most advantageously provided in the form of a slab, but alternatively it could be of granular form, or it could be injected
25 subsequent to bonding the sheets 12 and 13 to the frame 10.

The core 14 is preferably of high density foam material, and is typically of high density expanded

polystyrene. However, as an alternative, the core could be of (or could include) fire retardant material, comprising, for example, expanded perlite, mineral fibres and binders, which will slow down the progress of fire.

5 In order to give the frame adequate strength, each frame member 11 preferably has a width of at least 80 mm, and typically a width of about 90 mm, as measured in a plane parallel to the skins 12 and 13, although in some doors the width of the frame members may be
10 substantially smaller and typically 50mm. The frame members 11 and core 14 are each typically 40 mm thick and the skins 12 and 13 are each typically 2 mm thick.

 The skins 12 and 13 can be provided with an integral, decorative pattern 15 to improve the aesthetic
15 appearance of the door. The pattern is formed by heating the plastics sheets, which form the skins 12 and 13, and drawing them down by vacuum over a shaped former to provide a raised pattern on one side of the sheet and a recessed pattern on the other side of the sheet.

20 The core 14 serves not only to give the door good thermally insulating and/or fire retardant properties, but it also serves to give support to the skins 12 and 13 and prevent significant flexing thereof. For this reason it is desirable that the core 14 should
25 be well packed between the skins 12 and 13 and should, if possible, also fill any large recesses which may be formed if either skin is provided with a decorative pattern.

The skins 12 and 13 may be of any desired colour and may, if desired, have a woodgrain finish.

The door can be provided with factory fitted hinges and door furniture, such as a handle and/or a
5 lock, a letterbox, a spy-hole, and a door knocker.

In order to make a door as described above, the frame 10 is first fabricated, and then one of the sheets 12 or 13 is bonded to one face of the frame. The core 14 is then placed within the frame 10 and the other sheet 13
10 or 12 is then bonded to the other face of the frame. Finally, any required hinges and door furniture are fitted and to facilitate this the sheets 12 and 13 may have pre-formed apertures.

Alternatively, the two sheets 12 and 13 could
15 be bonded to opposite faces of the frame 10, and then core material could be injected between the sheets 12 and 13 via a passage provided in the frame.

A door as described above, once installed, is virtually maintenance free. It is much more resistant to
20 bow and warp than conventional timber doors and more resistant to bow and twist than known doors having plastics skins attached to a rigid hardwood frame. There is therefore less tendency for the plastics skins to crack. The door also has good thermally insulating or
25 fire retardant properties. It is much cheaper than extruded aluminium doors, and by keeping the outer peripheral edge of the frame exposed, the door can be trimmed to size, on site, with a plane.

Referring to Figure 2, the door shown therein differs from that shown in Figure 1, in that it is provided with a glazed panel 16. The panel 16 is, by way of example, a double glazed unit, having two clear glass
5 panes separated by an air gap. However, as an alternative, the panel 16 could be single glazed, or could be triple glazed, in which case it could be provided with a stained or bevelled panel between two clear glass panes.

10 In order to fit the panel 16 into the door, the two skins 12 and 13 are provided with apertures 17 and 18, respectively (see Figure 3), which are aligned with one another. The aperture 17 in skin 12, which in the case of an external door is preferably on the outer side of the
15 door, has a height and width slightly less than the height and width of the panel 16 and the aperture 18 in the skin 13 has a height and width slightly greater than height and width of the panel 16. There is also an aperture 19 in the core 14 of similar size to the aperture 18. A bead of
20 silicone sealant is applied to a marginal edge on the inner surface of the skin 12 to surround the aperture 17. The panel 16 is then placed within the apertures 18 and 19 so as to make contact with the silicone sealant. Metal retaining clips 20 are then clipped under the edge of the
25 aperture 18 and the clips are then pressed towards the glazed panel in order to fix the glazed panel in place. Finally, a double sided tape gasket is first secured to a backing plate and is then pressed firmly over the clips

20.

The glazed panel 16 can be of any convenient shape, including rectangular, substantially rectangular and crescent shape, and more than one glazed unit can be provided in a door. The glazed panel 16 can be factory
5 fitted or supplied as part of a kit.

The embodiments described above are given by way of example only and various modifications will be apparent to persons skilled in the art without departing
10 from the scope of the invention.

CLAIMS

1. A door comprising a rigid frame between two outer plastics skins, and thermally insulating and/or
5 flame retardant material within the frame and between the plastics skins, wherein the frame comprises a plurality of frame members, each comprising a plurality of timber strands which have been treated with resin and pressed together.
- 10 2. A door as claimed in claim 1, wherein the strands are aspen strands.
3. A door as claimed in claim 1 or claim 2,
15 wherein the strands are arranged in a plurality of substantially parallel layers, each of which comprises a plurality of randomly orientated strands.
4. A door as claimed in any one of claims 1 to 3,
20 wherein the resin is a polyurethane resin.
5. A door as claimed in any one of the preceding claims, wherein said skins are of thermoplastics material.
- 25 6. A door as claimed in claim 5, wherein at least one of said skins is provided with a decorative pattern.

7. A door as claimed in any one of the preceding claims, wherein thermally insulating material in slab form is provided within the frame and between the plastics skins.

5

8. A door as claimed in any one of claims 1 to 6, wherein thermally insulating material is provided in granular form within the frame and between the plastics skins.

10

9. A door as claimed in any one of the preceding claims, wherein each frame member has a minimum width of 80mm as measured in a plane parallel to the plastics skins.

15

10. A door as claimed in any one of the preceding claims, wherein the plastics skins are bonded to the frame by a moisture curing polyurethane adhesive.

20 11. A door as claimed in claim 10, wherein the adhesive has a viscosity in the range of 150 to 250 centipoise.

12. A door as claimed in any one of the preceding
25 claims and having a glazed panel.

13. A door as claimed in claim 12, wherein the glazed panel is a sealed unit comprising two or more

spaced glazing members.

14. A door as claimed in claim 12 or claim 13,
wherein the two skins each have apertures aligned with
5 the glazed panel, the aperture in one of the skins being
slightly smaller than the glazed panel, and the aperture
in the other skin being slightly larger than the glazed
panel, the glazed panel being located against the inner
face of said one skin and being located with respect to
10 the other skin by retaining means.

15. A door as claimed in any one of the preceding
claims, wherein the outer peripheral edge of the frame
is exposed.

15

16. A door substantially as hereinbefore described
with reference to the accompanying drawings.

17. A method of manufacturing a door comprising
20 the steps of:

- (a) forming a frame comprising a plurality of
frame members each comprising a plurality of timber
strands which have been treated with a resin and pressed
together;
- 25 (b) securing a first plastics skin to one face of
the frame;
- (c) placing thermally insulating and/or flame
retardant material within the frame; and

(d) securing a second plastics skin to the other face of the frame.

18. A method of manufacturing a door comprising
5 the steps of:-

(a) forming a frame comprising a plurality of frame members each comprising a plurality of timber strands which have been treated with a resin and pressed together;

10 (b) securing first and second plastics skins to opposite faces of the frame; and

(c) injecting thermally insulating and/or flame retardant material into the space defined between the frame and the plastics skin.

15

19. A method as claimed in claim 17 or claim 18, wherein at least one of the skins is provided with a decorative pattern by vacuum forming at an elevated temperature.

20

20. A method as claimed in any one of claims 17 to 19, wherein the strands are aspen strands.

21. A method as claimed in any one of claims 17 to
25 20, wherein the strands are arranged in a plurality of substantially parallel layers, each of which comprises a plurality of randomly orientated strands.

22. A method as claimed in any one of claims 17 to 21, wherein the resin is a polyurethane resin.

23. A method as claimed in claim 22, wherein the
5 plastics skins are bonded to the frame by a moisture curing polyurethane adhesive having a viscosity in the range of 150 to 250 centipoids.

24. A method as claimed in any one of claims 17 to
10 23, wherein the method also includes the step of providing a glazed panel in the door.

25. A method as claimed in claim 24, wherein the two skins are each provided with an aperture, the
15 aperture in one of the skins being slightly larger than the panel and the aperture in the other skin being slightly smaller than the panel, and the glazed panel is passed through the aperture in the one skin to make contact with a part of the other skin surrounding the
20 aperture therein and the glazed panel is then fixed within the door by retaining means.

26. A method of manufacturing a door substantially as hereinbefore described with reference to the
25 accompanying drawings.

- 15 -

Relevant Technical Fields

- (i) UK CI (Ed.M) E1J: JGL; JGS; JM
 (ii) Int CI (Ed.5) E06B 003/72, 003/74, 003/76, 003/78

Search Examiner
 JOHN ROWLATT

Date of completion of Search
 26 JULY 1994

Databases (see below)

(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

Documents considered relevant following a search in respect of Claims :-
 1-26

(ii) ONLINE WORLD PATENTS INDEX

Categories of documents

- X:** Document indicating lack of novelty or of inventive step. **P:** Document published on or after the declared priority date but before the filing date of the present application.
Y: Document indicating lack of inventive step if combined with one or more other documents of the same category. **E:** Patent document published on or after, but with priority date earlier than, the filing date of the present application.
A: Document indicating technological background and/or state of the art. **&:** Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages	Relevant to claim(s)
X	US 5218807 A (FULFORD)	1, 17 and 18
X	US 4716700 A (HAGEMEYER)	1, 17 and 18
X	US 3994110 A (ROPELLA)	1, 17 and 18
X	FR 002535961 A3 (CHRISTOPH RECKORD)	1, 17 and 18
X	JP 0501490063 A (MATSUSHITA)	1, 17 and 18

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